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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,697	09/30/2003	Amanda Baer	HSJ9-2003-0032US1 (0107-0)	6166
7590 05/23/2005			EXAMINER	
ATTN: John J. Oskorep One Magnificent Mile Center Suite 1400 980 N. Michigan Avenue Chicago, IL 60611			ARANCIBIA, MAUREEN GRAMAGLIA	
			ART UNIT	PAPER NUMBER
			1763	
DATE MAILED: 05/23/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/675,697

Applicant(s)

BAER ET AL.

Examiner

Maureen G. Arancibia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 March 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 4, 6, 8-16, 18 and 21-30 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1, 2, 4, 6, 8-16, 18, and 21-30 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 4 and 30 are objected to because of the following informalities: Lines 1-2 of Claim 4 should read "The method of claim 1, further comprising:". It appears that Claim 30 should be corrected to recite "wherein the second protective layer is formed over the read sensor layers and surrounding insulator materials" since the first protective layer is formed before the surrounding insulator materials. Claim 30 has been interpreted with this correction in mind. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, it is unclear whether the limitation "the photoresist structure" recited on Lines 1-2 of the claim refers to the first photoresist structure or the second photoresist structure. For the purposes of the following examination on the merits, this limitation has been interpreted to refer to the first photoresist structure.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**5. Claims 1, 2, 4, 6, 8-10, 12-16, 18, 22-26, and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,315,875 to Sasaki in view of U.S. Patent Application Publication 2004/0027730 to Lille.**

**In regards to Claim 1,** Sasaki teaches a method of forming a read sensor for a magnetic head, comprising, prior to forming a track width for a read sensor: forming a first protective layer 5g over a plurality of read sensor layers (Figure 13; Column 11, Line 58); forming a first photoresist layer 21 in a central region over the plurality of read sensor layers (Figures 13-14; Column 12, Lines 1-5); etching the read sensor layers to define a stripe height for the read sensor (Figure 16; Column 12, Lines 55-62); forming an insulating layer 4b around the read sensor (Column 12, Line 63 - Column 13, Line 2); and removing the photoresist layer. (Column 13, Line 2) Sasaki teaches that the method further comprises, after defining the stripe height: forming a second photoresist layer 23 in a central region over the read sensor layers (Column 13, Lines 27-29), and etching the exposed portions of the read sensor layers to define a track width W for the read sensor. (Figure 19; Column 13, Lines 32-34)

**In regards to Claim 1,** Sasaki does not expressly teach that the first protective layer 5g can be removed by etching.

Lille teaches that a protective layer 908 formed between the read sensor layers and a photoresist structure can be removed by etching. (Paragraphs 53, 54)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Sasaki to remove the first protective layer by etching. The motivation for

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doing so, as taught by Lille (Paragraph 54), would have been to expose the underlying read sensor layers to an oxygen plasma in order to increase the sensitivity of the read sensor:

**In regards to Claims 1 and 6**, Sasaki does not expressly teach that the first photoresist can be removed by mechanical compression with a chemical-mechanical polishing (CMP) pad.

Lille teaches that a photoresist used in a method of forming a read sensor can be sheared off by CMP. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to use the CMP method taught by Lille in the practice of Sasaki. The motivation for doing so, as taught by Lille (Paragraph 53), is that CMP can successfully remove the resist even when other materials have been deposited on it.

**In regards to Claim 2**, Sasaki does not expressly teach that the photoresist 21 can be formed without an undercut.

Lille teaches that a photoresist 2002 used in a method of forming a read sensor can be formed without an undercut. (Figure 20; Paragraph 45)

It would have been obvious to form the photoresist taught by Sasaki without an undercut, as taught by Lille. The motivation for doing so would have been to form the photoresist in a single step, rather than depositing it in two layers, as Lille discloses is also known in the prior art (Paragraph 45).

**In regards to Claim 4**, Sasaki also teaches forming hard bias layer 61 and lead layer 6 around the read sensor (Figure 19; Column 13, Lines 38-61), and removing the second photoresist 23 (Column 13, Lines 57-58).

Sasaki does not expressly teach that the second photoresist can be removed by CMP.

Lille teaches that a photoresist used in a method of forming a read sensor can be sheared off by CMP. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to use the CMP method taught by Lille to remove the second photoresist taught by Sasaki. The motivation for doing so, as taught by Lille (Paragraph 53), is that CMP can successfully remove the resist even when other materials have been deposited on it.

**In regards to Claim 8**, the combination of Sasaki and Lille discussed above does not expressly teach that a second protective layer of insulator material is formed prior to removing the first photoresist structure.

However, Lille additionally teaches that a second protective layer 2302 of insulator material should be formed over materials that surround the read sensor layers before removing a photoresist structure. (Figure 23; Paragraph 53)

It would have been obvious to one of ordinary skill in the art to further modify the combination of Sasaki and Lille to form a second protective layer of insulator material before removing a photoresist structure. The motivation for doing so, as taught by Lille (Paragraph 53), would have been to protect the surrounding materials from the CMP removal of the photoresist.

**In regards to Claims 9 and 10**, the combination of Sasaki and Lille as applied to Claim 8 does not expressly teach that the second protective layer has a thickness of 100-200 Angstroms, or that both the first and second protective layers can comprise carbon.

Lille teaches that first protective layer 908 and second protective layer 2302 can each be formed of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to make each protective layer of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms, as taught by Lille. The motivation for doing so would have been to use protective layers that are CMP-resistant. (Paragraph 53)

**In regards to Claim 12**, Sasaki teaches a method of forming a stripe height for a read sensor for a magnetic head, comprising: forming a first protective layer 5g over a plurality of read sensor layers (Figure 13; Column 11, Line 58); forming a first photoresist layer 21 in a central region over the plurality of read sensor layers (Figures 13-14; Column 12, Lines 1-5); etching the read sensor layers to define a stripe height for the read sensor (Figure 16; Column 12, Lines 55-62); and removing the photoresist layer. (Column 13, Line 2) Sasaki teaches that the method further comprises, after defining the stripe height: forming a second photoresist layer 23 in a central region over the read sensor layers (Column 13, Lines 27-29), and etching the exposed portions of the read sensor layers to define a track width W for the read sensor. (Figure 19; Column 13, Lines 32-34)

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Sasaki does not expressly teach that a second protective layer is formed prior to removing the first photoresist structure.

Lille teaches that a second protective layer 2302 of insulator material should be formed over materials that surround the read sensor layers before removing a photoresist structure. (Figure 23; Paragraph 53)

It would have been obvious to one of ordinary skill in the art to further modify the method taught by Sasaki to form a second protective layer before removing a photoresist structure. The motivation for doing so, as taught by Lille (Paragraph 53), would have been to protect the surrounding materials from the CMP removal of the photoresist.

The combination of Sasaki and Lille just discussed does not expressly teach that the first and second protective layers can be removed by etching.

Lille teaches that the protective layers can be removed by etching. (Paragraph 54, "any CMP-resistant layer")

It would have been obvious to one of ordinary skill in the art to further modify the method taught by Sasaki to remove the first and second protective layers by etching. The motivation for removing the first protective layer, as taught by Lille (Paragraph 54), would have been to expose the underlying read sensor layers to an oxygen plasma in order to increase the sensitivity of the read sensor. The motivation for removing the second protective layer would have been to expose the surrounding materials to further processing.

**In regards to Claims 12 and 16**, the combination of Sasaki and Lille just discussed does not expressly teach that the first and second photoresists can be removed by mechanical compression with a chemical-mechanical polishing (CMP) pad.

Lille teaches that a photoresist used in a method of forming a read sensor can be sheared off by CMP. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to use the CMP method taught by Lille to remove the photoresists taught by Sasaki. The motivation for doing so, as taught by Lille (Paragraph 53), is that CMP can successfully remove the resist even when other materials have been deposited on it.

**In regards to Claim 13**, Sasaki teaches that after the read sensors are etched using the photoresist as a mask, and prior to removing the photoresist, an insulating layer 4b is formed around the read sensor. (Column 12, Line 63 - Column 13, Line 2)

**In regards to Claim 14**, Sasaki also teaches forming hard bias layer 61 and lead layer 6 around the read sensor (Figure 19; Column 13, Lines 38-61).

**In regards to Claim 15**, Sasaki does not expressly teach that the photoresists 21, 23 can be formed without an undercut.

Lille teaches that a photoresist 2002 used in a method of forming a read sensor can be formed without an undercut. (Figure 20; Paragraph 45)

It would have been obvious to form the photoresists taught by Sasaki without an undercut, as taught by Lille. The motivation for doing so would have been to form the photoresists each in a single step, rather than depositing them in two layers, as Lille discloses is also known in the prior art (Paragraph 45).

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**In regards to Claims 18 and 22**, the combination of Sasaki and Lille as applied to Claim 12 does not expressly teach that the protective layers each have a thickness of 100-200 Angstroms, or that both protective layers can comprise carbon.

Lille teaches that first protective layer 908 and second protective layer 2302 can each be formed of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to make each protective layer of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms, as taught by Lille. The motivation for doing so would have been to use protective layers that are CMP-resistant. (Paragraph 53)

**In regards to Claim 23**, Sasaki teaches a method of forming a stripe height for a read sensor for a magnetic head, comprising: forming a first protective layer 5g over a plurality of read sensor layers (Figure 13; Column 11, Line 58); forming a first photoresist layer 21 in a central region over the plurality of read sensor layers (Figures 13-14; Column 12, Lines 1-5); etching the read sensor layers to define a stripe height for the read sensor (Figure 16; Column 12, Lines 55-62); forming an insulating layer 4b around the read sensor (Column 12, Line 63 - Column 13, Line 2); and removing the photoresist layer. (Column 13, Line 2)

**In regards to Claim 23**, Sasaki does not expressly teach that the photoresist 21 can be formed without an undercut.

Lille teaches that a photoresist 2002 used in a method of forming a read sensor can be formed without an undercut. (Figure 20; Paragraph 45)

It would have been obvious to form the photoresist taught by Sasaki without an undercut, as taught by Lille. The motivation for doing so would have been to form the photoresist in a single step, rather than depositing it in two layers, as Lille discloses is also known in the prior art (Paragraph 45).

**In regards to Claim 23**, Sasaki does not expressly teach that a second protective layer is formed prior to removing the first photoresist structure.

Lille teaches that a second protective layer 2302 of insulator material should be formed over the read sensor layers and surrounding materials before removing a photoresist structure: (Figure 23; Paragraph 53)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Sasaki to form a second protective layer before removing a photoresist structure. The motivation for doing so, as taught by Lille (Paragraph 53), would have been to protect the surrounding materials from the CMP removal of the photoresist.

**In regards to Claim 23**, the combination of Sasaki and Lille just discussed does not expressly teach that the first and second protective layers can be removed by etching.

Lille teaches that the protective layers can be removed by etching. (Paragraph 54, "any CMP-resistant layer")

It would have been obvious to one of ordinary skill in the art to further modify the method taught by Sasaki to remove the first and second protective layers by etching. The motivation for removing the first protective layer, as taught by Lille (Paragraph 54), would have been to expose the underlying read sensor layers to an oxygen plasma in

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order to increase the sensitivity of the read sensor. The motivation for removing the second protective layer would have been to expose the surrounding materials to further processing.

**In regards to Claim 23**, the combination of Sasaki and Lille just discussed does not expressly teach that the first photoresist can be removed by mechanical compression with a chemical-mechanical polishing (CMP) pad.

Lille teaches that a photoresist used in a method of forming a read sensor can be sheared off by CMP. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to use the CMP method taught by Lille to remove the photoresist taught by Sasaki. The motivation for doing so, as taught by Lille (Paragraph 53), is that CMP can successfully remove the resist even when other materials have been deposited on it.

**In regards to Claim 24**, Sasaki teaches that the method further comprises, after defining the stripe height: forming a second photoresist layer 23 in a central region over the read sensor layers (Column 13, Lines 27-29), and etching the exposed portions of the read sensor layers to define a track width W for the read sensor. (Figure 19; Column 13, Lines 32-34)

**In regards to Claim 24**, Sasaki does not expressly teach that the photoresist 23 can be formed without an undercut.

Lille teaches that a photoresist 2002 used in a method of forming a read sensor can be formed without an undercut. (Figure 20; Paragraph 45)

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It would have been obvious to form the photoresist taught by Sasaki without an undercut, as taught by Lille. The motivation for doing so would have been to form the photoresist in a single step, rather than depositing it in two layers, as Lille discloses is also known in the prior art (Paragraph 45).

**In regards to Claim 25**, see the discussion of Claim 24.

The combination of Sasaki and Lille as applied to Claim 24 does not expressly teach that the second photoresist can be removed by mechanical compression with a chemical-mechanical polishing (CMP) pad.

Lille teaches that a photoresist used in a method of forming a read sensor can be sheared off by CMP. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to use the CMP method taught by Lille to remove the photoresist taught by Sasaki. The motivation for doing so, as taught by Lille (Paragraph 53), is that CMP can successfully remove the resist even when other materials have been deposited on it.

**In regards to Claims 26 and 28**, the combination of Sasaki and Lille as applied to Claim 23 does not expressly teach that the protective layers each have a thickness of 100-200 Angstroms, or that both protective layers can comprise carbon.

Lille teaches that first protective layer 908 and second protective layer 2302 can each be formed of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms. (Paragraph 53)

It would have been obvious to one of ordinary skill in the art to make each protective layer of diamond-like carbon (DLC) with a thickness of 40-200 Angstroms, as

taught by Lille. The motivation for doing so would have been to use protective layers that are CMP-resistant. (Paragraph 53)

**In regards to Claims 29 and 30**, the combination of Sasaki and Lille as applied to Claim 23 teaches that the first protective layer is formed over the read sensor layers and that the second protective layer is formed over the read sensor layers and the surrounding materials, which, as taught by Sasaki, are insulator materials 4b.

**6. Claims 11, 21, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki in view of Lille as applied to Claims 10, 18, and 26, and further in view of U.S. Patent Application Publication 2002/0030443 to Konuma et al.**

The combination of Sasaki and Lille as discussed above in regards to Claims 10, 18, and 26 teaches two protective layers, both comprising diamond-like carbon.

The combination of Sasaki and Lille does not expressly teach that the hardness of the DLC protective layer can be 22 GPa.

Konuma et al. teaches that a DLC thin film can have a hardness of 15-25 GPa. (Paragraph 82)

It would have been obvious to one of ordinary skill in the art to make the DLC films taught by the combination of Sasaki and Lille with a hardness of 22 GPa, which is in the range taught by Konuma et al. The motivation for doing so, as taught by Konuma et al. (Paragraph 82), would have been to have protective layers that are not only hard, but do not transmit oxygen or moisture.

### ***Response to Arguments***

7. Applicant's arguments filed 03/02/2005 have been fully considered but they are not persuasive. Specifically, in regards to Applicant's argument that the prior art of record alone or in combination does not teach the claimed invention, the Examiner disagrees. The Examiner's response consists of the rejections set forth above.

***Conclusion***

8. Applicant's amendment necessitated any new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

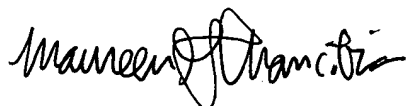
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Maureen G. Arancibia  
Patent Examiner, AU 1763



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